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APPLICATION FOR LETTERS PATENT

Providing Enhanced Content With Broadcast Video

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1 **TECHNICAL FIELD**

2 This invention relates methods and systems for providing and displaying
3 ancillary data content with transmitted video and audio.
4

5 **BACKGROUND OF THE INVENTION**

6 Displaying live video on a personal computer (PC) is becoming more and
7 more common. A number of low cost video capture boards allow for display of
8 analog video signals on the RGB display surface of a personal computer.
9 Moreover, higher quality digital video feeds distributed, for example, via Direct
10 Broadcast Satellite (DBS), will soon also be available on PCs. With the right
11 hardware, PCs will be able to display and decode DBS signals, analog cable
12 signals, and over-the-air-signals, as well as analog and digital video signals stored
13 locally (on a CD or VCR, for example).

14 In the future, television signal decoder circuitry for both analog and digital
15 signals will become extremely prevalent, if not standard, on all PCs. By enabling
16 a user or viewer to work with, view, and use both data and video simultaneously,
17 the PC will better the user's or viewer's experience beyond a standard television.

18 In this new broadcast environment, television broadcasters will want to take
19 advantage of PC capabilities by providing digital program enhancements. For
20 example, a broadcaster might want to provide ancillary statistics during a sports
21 broadcast, allowing a viewer to find more detailed information on a particular team
22 or player. Similarly, a broadcaster might provide relevant information on the topic
23 of a documentary, so that the viewer can access more detailed information either
24 during or after the broadcast. As another example, it might be desired to advertise
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1 program-related merchandise during a program—such as dolls or other toys during
2 a children's cartoon program.

3 This method of delivering data to PCs is particularly attractive in areas of
4 the world where there is not a great deal of traditional data infrastructure. For
5 example, consider India which has a middle class population of about 300 million
6 people (greater than the entire population of the US): while individuals can afford
7 a PC and many do have PCs, few have experienced the Internet or high speed data
8 networking, because of underdeveloped telecommunications infrastructure. The
9 possibility of delivering data services to such locations presents a number of
10 opportunities.

11 Recent years have also seen many efforts to develop what is referred to as
12 "interactive television." Interactive television allows a viewer to interact with a
13 cable television service provider. Various enhanced features are envisioned for
14 interactive television systems. For instance, interactive program guides can be
15 implemented for viewers. Using an interactive program guide, a viewer can scroll
16 through television listings using cursor control buttons on a remote control. A
17 viewer can also perform interactive searches of program content. Some interactive
18 TV systems have included the ability for broadcasters to provide ancillary data
19 along with video feeds.

20 There has been no widespread acceptance of any interactive television
21 system. One impediment to such widespread acceptance is that each system uses
22 different standards and protocols for providing data that is ancillary to the primary
23 video content. Unless a single system is instituted as a standard, broadcasters will
24 have to provide ancillary data in numerous different formats. This is a significant
25 impediment.

1 The invention removes this impediment by utilizing conventional formats
2 for providing ancillary data along with video broadcasts, along with a scheme for
3 overlaying digital data content on the primary video stream.
4

5 **SUMMARY OF THE INVENTION**

6 The invention allows video broadcasters to prepare ancillary data content as
7 HTML files. The HTML files are prepared as overlays, with backgrounds of a
8 pre-determined color key for viewing with video equipment having color keying
9 features. At a receiver, the HTML overlays are rendered using typical Internet
10 browser technology in the same display area as broadcast video, using color
11 keying. This makes the overlay background appear transparent: the video appears
12 only in the background areas of the HTML overlays.
13

14 **BRIEF DESCRIPTION OF THE DRAWINGS**

15 Fig. 1 is a block diagram of a video broadcasting system in accordance with
16 the invention.

17 Fig. 2 is a block diagram of an exemplary receiver in accordance with the
18 invention.

19 Fig. 3 shows how video, HTML overlays, and frame windows are
20 configured in accordance with the invention

21 Figs. 4 and 5 are flowcharts showing preferred methodological steps in
22 accordance with the invention.
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1 analog realm, in which Philips sells a device called the Ghost Echo Cancellation
2 Reference Signal. By injecting a known digital stream on a single analog
3 television VBI line, advanced televisions or PCs can more easily detect when a
4 multipath (ghost) signal is received and take measures to clean up the image.
5 There are about 800 TV stations in the US that implements this signal.

6 When using more traditional broadcast sources, such as analog RF
7 television broadcasts, data can be transmitted in the vertical blanking interval of
8 the television signal. This method is currently used to provide closed captioning
9 for the hearing impaired. Digital data that has been transmitted in this way can be
10 extracted from a television signal in a number of ways that are known in the
11 industry—most currently-manufactured televisions have the capability of
12 extracting and displaying closed captioning information. External closed caption
13 decoders are also available for this purpose. Additionally, a number of external
14 devices are available which extract closed caption data and transmit it over a serial
15 cable to personal computers or other devices. More recently, it has become
16 possible to decode closed captioning data directly inside a PC using newer video
17 and video tuner boards that allow for a television signal to be displayed on a PC.

18 There are other mechanisms that are also available for transmitting digital
19 data content to receivers 14. For example, it is possible to use a modem or other
20 conventional network connection for digital data transmissions. Network
21 connections such as these are independent of the traditional video transmission
22 media, and have the advantage that they allow bi-directional communications
23 between the broadcast source and the receivers. Communication facilities such as
24 the Internet can also be utilized. Cable television networks might also provide
25 similar communications capabilities. In addition, the newest plans for high-

1 definition digital terrestrial TV define channels that are capable of transmitting
2 19.3 megabit/second of any amount of digital video or data.

3 It should be noted that the audio/video stream and the digital data content
4 can be distributed using different media, respectively. While it is convenient to
5 use only a single media such as over-the-air transmission, it would also be possible
6 to distribute the digital data content using a physical medium such as a CD-ROM,
7 while the video is delivered using traditional broadcasts. Alternatively, both video
8 and data might in some cases be distributed using a physical, transportable
9 medium such as a CD-ROM.

10 In the preferred embodiment of the invention, broadcast source 12
11 broadcasts an analog or digital video stream and provides supplemental digital data
12 files to accompany the video stream. These data files have digital content that can
13 be rendered by receivers 14, apart from the video stream. The broadcast source
14 also provides timing specifications with the supplemental data files indicating
15 times for displaying the digital content, relative to the video stream.

16 The digital content is preferably authored in a standard, commonly used
17 graphical markup language. In the preferred embodiment of the invention, the
18 supplemental data files are prepared and formatted in a current version of a
19 Hypertext Markup Language (HTML). This allows broadcasters to use standard,
20 widely accepted authoring tools such as used for authoring Internet World Wide
21 Web content.

22 The supplemental digital data content preferably comprises one or more
23 hyperlink overlays. Each hyperlink overlay includes one or more hyperlinks. A
24 hyperlink is a displayed region or entity that can be selected or activated by a
25 viewer. Each hyperlink has a target, indicating some other content (usually stored

1 in a data file) that can be rendered for the viewer. When a hyperlink is activated,
2 its target is retrieved and rendered. For example, if the target is a text document,
3 the document is displayed. If the target is a file containing a digitized sound clip,
4 the sound clip is rendered. The most common use of hyperlinks is to move or
5 “navigate” from one document or object to another.

6 It will be apparent to those familiar with Internet technology that the
7 hyperlink overlays described above are similar to documents (often referred to as
8 “Web pages”) that can be viewed when browsing the Internet’s World Wide Web.
9 This is an attractive feature of the invention, because it allows broadcasters to use
10 existing Internet content development tools for designing ancillary digital data
11 content.

12 One difference from a conventional Web page is that a hyperlink overlay in
13 accordance with the invention has a background that is set to a predetermined key
14 color. Background areas, set to the key color, are intended to be transparent. A
15 background such as this is easily created, again using standard Internet content
16 development tools such as Microsoft’s Front Page® web designer.

17 In this embodiment of the invention, receivers 14 are conventional personal
18 computers (PCs) with equipment having display hardware for receiving and
19 displaying broadcast video streams such as television signals and digital video
20 broadcasts. The PC is also associated with a satellite dish 15 for receiving digital
21 satellite broadcasts, or a regular antenna for receiving analog TV signals.

22 The display hardware includes bit-mapped graphics capabilities for
23 displaying static bit-mapped images in conjunction with conventional application
24 programs, in addition to video display capabilities. Furthermore, PCs 14 include
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1 video color keying hardware that can be configured to display video only in
2 display areas that are set to a key color.

3 Alternatively, receivers 14 might comprise other types of devices such as
4 enhanced television units having capabilities similar to the PC described herein.

5 As an example implementation, PC 14 is a personal computer having a
6 processor (e.g., x86 or Pentium® microprocessor from Intel Corporation);
7 memory, a computer monitor (e.g., VGA, SVGA), and one or more input devices
8 (e.g., keyboard, mouse, etc.).

9 PC 14 has a digital receiver configured to receive digital broadcast data in a
10 packetized format such as MPEG-encoded digital video and audio data. Such a
11 digital receiver also has access means for reading supplemental data files received
12 from satellite broadcasts—the receiver can receive digital data in many different
13 forms, including software programs, programming information, and other ancillary
14 data in the form of data files.

15 The PC runs an operating system that supports multiple applications. The
16 operating system is preferably a multitasking operating system that allows
17 simultaneous execution of multiple applications. The operating system employs a
18 graphical user interface in a windowing environment which presents the
19 applications or documents in specially delineated areas of the display screen called
20 “windows.” One preferred operating system is a Windows® brand operating
21 system sold by Microsoft Corporation, such as Windows 95 or Windows NT,
22 Windows CE or other derivative versions of Windows®. It is noted, however, that
23 other operating systems that provide windowing environments may be employed,
24 such as the Macintosh operating system from Apple Computer, Inc. and the OS/2
25 operating system from IBM.

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1 One example implementation of a broadcast-enabled PC is described in a
2 co-pending U.S. Patent Application Serial No. 08/503,055, entitled "Broadcast-
3 Enabled Personal Computer," filed January 29, 1996. This application is assigned
4 to Microsoft Corporation, and is incorporated herein by reference.

5 Fig. 2 shows an example implementation of PC 14 in more detail. PC 14 is
6 enhanced for purposes of displaying broadcast television and accompanying digital
7 data content. It includes a motherboard (not shown) having a processor 52 (e.g.,
8 x86 or Pentium® microprocessor from Intel Corporation) and volatile memory 54.
9 Volatile memory 54, in combination with non-volatile memory 55, forms program
10 storage memory 56. Non-volatile memory 55 comprises a floppy disk, a hard disk,
11 a CD-ROM, or some other type of computer-readable storage media. Application
12 programs, containing instructions for performing the steps described herein, are
13 contained in the storage media.

14 PC 14 includes a digital broadcast receiver 58, such as a satellite dish
15 receiver, RF receiver, microwave receiver, or the like. The digital receiver 58
16 receives digital data broadcast over a broadcast network such as a satellite
17 network. The receiver 58 is coupled to a tuner 60 which tunes to frequencies or
18 channels of the broadcast network. The tuner 60 has one or two primary
19 components: a specialized digital broadcast tuner and/or a generalized digital
20 broadcast tuner. The specialized digital broadcast tuner is configured to receive
21 digital broadcast data in a particularized format, such as MPEG-encoded digital
22 video and audio data. The generalized digital broadcast tuner is configured to
23 receive digital data in many different forms, including software programs and
24 other ancillary data.
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1 conjunction with whatever bit-mapped monitor image has been put in place by
2 executing software. In effect, the video subsystem overwrites the normal bit-
3 mapped display image with the video stream. However, the video subsystem is
4 configured to overwrite only those areas of the bit-mapped display image that are
5 set to a predetermined color or chroma key value. Thus, a bit-mapped image can
6 be created having "transparent" areas or regions that are set to the color key value.
7 The video stream will be displayed only in these transparent regions, so that the
8 bit-mapped image will appear to overlay the video stream.

9 Tseng Labs, Cirrus Logic, Brooktree, ATI and S3 are examples of
10 companies that manufacture video subsystems such as this.

11 Monitor 68 is preferably a VGA or SVGA monitor as is customary for
12 personal computers, as opposed to a standard television. In the illustrated
13 implementation, PC 14 does not convert the television-related data into an NTSC
14 (National Television System Committee) format. Because of this, PC 14 is able to
15 produce television data having superior quality when displayed on the VGA
16 monitor. Other embodiments might convert images from VGA to NTSC for
17 display on a standard TV screen, although they would have comparatively lower
18 graphics resolution.

19 The PC 14 also includes a second bus 130, such as an ISA (Industry
20 Standard Architecture) bus, coupled to the motherboard and data processor 52. An
21 audio board 132 is coupled to the ISA bus 130 and serves as an interface with a
22 number of audio output devices, such as conventional speakers. An amplifier may
23 be coupled between the audio board and speakers if desired. The audio board is
24 also coupled to the video subsystem 66 to receive decoded audio signals. The
25 audio board 132 can be coupled to a stereo system 134, so that audio data can be

1 output to the stereo system for enhanced sound and recorded. Newer computer
2 systems might alternatively support sending digital audio streams outside the PC
3 via a Universal Serial Bus or IEEE1394 connection to an external converter. This
4 eliminates the need for an internal sound card and results in much higher fidelity
5 audio.

6 A CD-ROM (or DVD) drive 136 is coupled to the ISA bus 130. The audio
7 output produced by the CD ROM (or DVD) drive 136 is passed to the audio board
8 132.

9 PC 14 includes a modem 138, such as a 14.4 or 28.8 kbps fax/data modem,
10 coupled to the ISA bus 130. The modem 138 is connected to a conventional
11 telephone line and provides access to public networks, including the Internet. The
12 modem 138 can be used to access and download data and supplemental content
13 directly from an independent service provider. It can also be used to download
14 supplemental data files originating from a broadcast source. Additionally, the
15 modem 138 can be used for two-way communications with the broadcast source or
16 another entity providing broadcast-related services.

17 An input/output (I/O) adapter 140 is coupled to the ISA bus 130 to interface
18 with numerous I/O devices, including a digital tape driver 142, a floppy disk drive
19 144, and a hard disk driver 146. A remote receiver 148 is also coupled to the I/O
20 adapter 140 for receiving signals from the remote cordless keyboard 66 and remote
21 control handset 68 in an IR or RF format. Alternatively, the keyboard and handset
22 can be directly wired to the computer. The I/O adapter 140 further provides
23 conventional serial ports, including a COM1 port 150, a COM2 port 152, and an
24 LPT1 port 154. An IR transmitter (not shown) can be coupled to the COM1 port
25 150 to generate infrared signals to control electronic devices, such as stereo

1 equipment, VCR, and the like. The computer 60 can also be hooked directly to
2 these components.

3 In accordance with the invention, PC 14 is programmed or configured to
4 receive a digital video stream and accompanying HTML files from a broadcast
5 source, and to display the video stream in conjunction with the hyperlink overlays
6 defined by the HTML files.

7 Fig. 3 shows how this is accomplished. An overlay window 200 is opened
8 for displaying a hyperlink overlay. Video subsystem 66 is configured to display
9 the video stream in a viewport 201 that coincides in size and position with the
10 overlay window 200. The video subsystem is also configured to display the video
11 stream only over those areas of the hyperlink overlay that are not set to the
12 predetermined color key. Thus, non-transparent areas of the hyperlink overlay
13 appear "through" the video stream, and appear to overlay the video stream.
14 Perhaps the best example of this behavior is the TV weatherman who appears to
15 "float" in front of a weather map. A frame window 202 is also utilized to define
16 the edges of overlay window 200 and viewport 201. These three components are
17 configured to appear as a single window to a user. Operating software is
18 configured so that the user can resize and move the components as a single entity.

19 Overlay window 200 is preferably implemented using an ActiveX™
20 control that is designed specifically for displaying an HTML-formatted document.
21 Such an ActiveX™ HTML control is configured to also allow browsing or
22 navigating among documents by activating hyperlinks. ActiveX™ is a standard
23 for interchangeable components that has been defined by Microsoft Corporation.
24 ActiveX™ controls are display entities that allow a user or viewer to interact with
25 programs through the display. In this case, the control displays an HTML-

1 formatted document, allows the user to activate hyperlinks, and retrieves and
2 displays the targets of such hyperlinks. A conventional HTML browser can
3 alternatively be used for displaying the hyperlink overlays.

4 Rather than associating displayed icons with hyperlinks, it is also possible
5 to create a totally transparent imagemask (using HTML terminology) to be
6 overlaid on top of the video. This results in "hot spots" on the screen that can be
7 clicked on for an action to occur. An example of this might be to create a hotspot
8 on top of an actor's body; clicking on the hotspot would reveal what the character
9 was thinking. Another example: a user could click on Tim Allen's Binford saw
10 during an episode of "Tool Time" to find out more information about it such as
11 where to purchase it.

12 Hyperlink overlays can be provided in groups corresponding to a particular
13 video stream, allowing navigation among various individual overlays of the group.
14 For example, a related group of overlays might be provided to a PC prior to the
15 beginning of a particular episode of a weekly television show. The first of the
16 overlays would be displayed at the beginning of the episode, and the viewer could
17 then follow hyperlinks as desired to view the other overlays of the group.

18 Alternatively, timing and other information can be provided to the PC along
19 with communication packets in which the overlays are transmitted. The timing
20 information indicates times, relative to the video stream, at which particular
21 overlays should be displayed. Hyperlinks can be activated to override the
22 specified timing. An alternative method to synchronize the video that doesn't rely
23 upon specific timing relative to the video stream is by using closed-caption text.
24 By examining a closed-caption stream, specific events can be triggered to occur
25 based upon when the actors on the screen enunciate certain words that serve as

1 reference marks. Such technology is described in a co-pending US patent
2 application Serial No. 08/779,270, entitled "System and Method For
3 Synchronizing Content With A Video Program Using Closed Captioning," filed
4 January 6, 1997. This patent application, which is assigned to Microsoft
5 Corporation, is hereby incorporated by reference.

6 PC 14 uses a stack-based algorithm to handle multiple overlays, so that one
7 overlay can be temporarily overwritten by another. For example, an emergency
8 news transmission might have overlays that would overwrite a regularly scheduled
9 show. When the emergency news transmission is complete, the previous overlays
10 are restored.

11 Fig. 4 shows preferred methodological steps performed by broadcast source
12 12 in accordance with the invention. A step 220 comprises transmitting a video
13 stream. The video stream can be in one of a variety of formats, such as a
14 traditional analog RF television format or a digital format originating from a
15 satellite or a cable headend.

16 A step 222 comprises formatting supplemental data files in a graphical
17 markup language, preferably HTML. Each supplemental HTML data file has
18 instructions for rendering a hyperlink page or overlay on the video stream at an
19 indicated time. Each overlay can have transparent areas or regions, which are set
20 to a key color or chroma color. Overlays can also contain hyperlinks to other
21 overlays and to other non-overlay documents and objects.

22 A step 224 comprises associating the supplemental data files with the video
23 stream. This step is performing by specifying control data such as timing
24 parameters along with the video stream, indicating times for displaying the
25 hyperlink overlays in relation to the video stream. Note that supplemental files are

1 sent prior to the time that they will be needed, taking data transmission speed into
2 account.

3 Step 226 comprises transmitting the supplemental data files along with the
4 video stream. As already discussed, this can be accomplished using the built-in
5 capabilities of the digital transmission media or using the vertical blanking interval
6 of a traditional analog television signal.

7 Fig. 5 shows steps performed by PC 14 or another receiver. A step 230
8 comprises receiving the video stream and accompanying supplemental from the
9 broadcast source. Step 232 comprises displaying the video stream on a display
10 device in a viewport using color keying technology, so that the video stream is
11 actually displayed only on areas of the display that are set to a predetermined key
12 color or chroma color.

13 A step 234 comprises displaying the hyperlink overlays, defined by the
14 supplemental data files, on the display device in conjunction with the video stream.
15 If the overlays have been previously cached, this step includes retrieving them
16 from cache storage. Control data, received along with the supplemental data files,
17 is used in this step to associate hyperlink pages or overlays with the video stream.
18 As a result, overlays are displayed at the times indicated by the timing
19 specifications contained in the control data, rather than at the time they are
20 received.

21 In the default case, an ActiveX™ control is used to display the hyperlink
22 overlays and to allow navigation using hyperlinks in the overlays. The ActiveX™
23 control is configured to occupy the same area as the video stream viewport. Thus,
24 the video stream is rendered in the transparent areas of the hyperlink overlays. In
25 some cases, PC 14 might actually create or render the ActiveX™ control ahead of

1 time, although the control is not made visible until the appropriate time. This
2 avoids any delay in presenting overlays.

3 Alternatively, control data might define multimedia objects that are not
4 transparent hyperlink overlays. When this is the case, a separate application
5 program is launched, such as an HTML-compatible browser, to render the object
6 defined by a supplemental data file. Such an application program is launched in its
7 own, independent window, and in the case of visually-oriented objects, can be
8 viewed alongside the video stream.

9 As noted, control data, transmitted along with the supplemental data files,
10 indicates how the supplemental data files should be handled. Primarily, the control
11 data indicates times at which the data files should be rendered or made visible. In
12 addition, the control data indicates what should happen when a viewer activates a
13 hyperlink from within an overlay. Generally, activating a hyperlink causes its
14 target to be displayed or otherwise rendered. However, there are two options when
15 a hyperlink's target is another transparent overlay: the target can either replace the
16 currently displayed overlay or the target can be displayed by an independent
17 browser in a new window that is opened just for this purpose. If the hyperlink's
18 target is not a transparent overlay, there is only one choice: the target is displayed
19 in a new window by launching an appropriate application program. Step 234 thus
20 includes a step of launching application programs as required to render non-
21 overlay content targeted by hyperlinks.

22 In the PC embodiment described above, these steps are performed under the
23 control of data processor 52, during execution of programming instructions that are
24 stored in program memory 56.
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1 While the invention has been described primarily for use with broadcast
2 video streams, note that video streams might also be available through other means
3 such as local storage (hard disk, DVD, CD, VCR, etc.). The invention is also
4 useful in conjunction with video sources such as these. For instance, a movie
5 might be provided on a DVD along with a group of transparent HTML overlay
6 files for use along with the movie. Alternatively, the movie might be provided on
7 a DVD, with the overlay files being downloaded from an Internet source.

8 Also note that even with broadcast sources, the transmission of
9 supplemental data files does not have to take place concurrently with transmission
10 of video streams. Rather, in some systems it might be desirable to broadcast
11 overlay files during the night to user equipment, for use the following day.
12 Control data indicates which programming the overlay files are to be associated
13 with, and software at the user's PC retrieves the appropriate files at the appropriate
14 times depending on the viewing selections of the user.

15 The invention provides an easy way for broadcasters and other video
16 providers to supply supplemental textual and graphical materials, and to have such
17 materials coordinated with video content. In contrast to prior systems, the
18 invention takes advantage of widely-used hypertext authoring packages, as thus
19 encouraging acceptance and standardization

20 In compliance with the statute, the invention has been described in language
21 more or less specific as to structural and methodical features. It is to be
22 understood, however, that the invention is not limited to the specific features
23 described, since the means herein disclosed comprise preferred forms of putting
24 the invention into effect. The invention is, therefore, claimed in any of its forms or
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1 modifications within the proper scope of the appended claims appropriately
2 interpreted in accordance with the doctrine of equivalents.
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